

## TOP FOR A CONVERTIBLE VEHICLE

### CROSS-REFERENCE TO RELATED APPLICATION

This application is a US National Phase of International Application No. PCT/DE 2005/000501, filed March 18, 2005, which claims priority to German 10 2004 016 201.8, filed April 1, 2004. The entire contents of the above identified applications are incorporated herein by reference.

### TECHNICAL FIELD

[0001] The invention relates to a top for a convertible vehicle according to the type further specified in the preamble of Claim 1.

### BACKGROUND OF THE INVENTION

[0002] In principle, when a flexible roof panel of a convertible top is attached, there is the possibility of attaching it to a separate bracket, which is moved with the motion of the convertible top, or the flexible roof panel can be attached to the body.

[0003] An example of attaching a flexible roof panel to a roof holding clamp connected to a convertible- top mechanism is known, for example, from DE 39 03 680 C1.

[0004] A top for a convertible vehicle with a flexible roof panel, which is attached directly to the body is known from EP 0 502 320 A2. For this, a convertible top attachment is provided with an attachment structure on the body at least in the rear part of the vehicle, in which the convertible top material is accommodated in the region of its edge with a clamping element. An auto-body clamping strip, having the attachment structure, and a clamping profile connected water-tight to the convertible top material with integrated clamping element are then clamped to each other in an auto-body shaft covered by body parts in the connection position. A cord insert, extending over the entire width of the rear part of the vehicle in the area of the trunk lid is proposed as an integrated clamping element in the clamping profile.

[0005] The clamping profile is clamped with an auto-body clamping strip held to body parts that are mounted on one edge of a water-channel sheet forming an auto-body shaft and lie beneath the trunk lid in the closed state of the convertible top, which lies against the flexible roof panel of the convertible top in the closed state of the convertible top with an auto-body closure seal that reduces friction.

[0006] In this known arrangement, there is little latitude in the configuration for arrangement of the clamping profile with the integrated clamping element, since a larger spacing between the auto-body closure seal of the trunk lid and the clamping profile provided to join the flexible roof panel to the auto body adversely affects the sealing effect in the region of the auto-body closure seal. Consequently, an arrangement of the clamping profile contained in the clamping element for the flexible roof panel in a vehicle height position close to the auto-body closure seal is advantageous. Such a comparatively high arrangement of the joining of the flexible roof panel to the auto body, however, means that the storage position of the convertible top must also be chosen relatively high with respect to the height of the vehicle, so that the latitude for configuration of the auto body and convertible top is significantly restricted.

[0007] A convertible top attachment is also known from DE 1 192 529, in which the convertible top material is held in an attachment structure designed as an attachment groove by a clamping element mounted from the outside, with which the convertible top material is pulled into the attachment groove in the form of a loop. A tension wire, which is positioned directly on the loop of the convertible top material and causes a notch effect that adversely affects the convertible top material on the edge when the necessary tightening forces are applied, then serves as a clamping element. The arrangement of the attachment of the convertible top material and the clamping element also does not permit a low arrangement of a convertible top storage space with respect to the height of the vehicle.

[0008] A roof of a vehicle structure to be opened is also known from US 4,708,398, in which a flexible convertible top is attached on the rear to the vehicle body. For sealing of the convertible top relative to the vehicle body, a two-part clamp is provided on each side of the vehicle with a part on the vehicle front side and a part on the vehicle rear side, which are joined

to each other via an articulation. In a transition from an open to a closed state of the convertible top, this two-part clamp is moved around a pivot axis on the vehicle front from a lowered storage position into a sealing position in the vehicle height direction that forces the convertible top against a sealing device on the auto-body side. The part of the clip on the vehicle rear side is then raised by a strip attached on the rear part of the clip and a transverse clip and held in the sealed position by this strip.

[0009] This type of configuration of the clip and its drive, however, is demanding.

[0010] Additional mechanisms for sealing of a roof cover of a convertible top relative to the Convertible vehicle body are described, for example in US 5,100,195, DE 19750 418 A1 and DE 1 192 592.

#### SUMMARY OF THE INVENTION

[0011] It is a task of the present invention is to devise a top for a convertible vehicle with a flexible roof panel of the type mentioned, in which storage of the convertible top at a low vehicle-height level is possible, while guaranteeing the necessary clamping effect and sealing effect in the closed state of the convertible top.

[0012] This task is solved according to the invention with a top for a convertible vehicle according to the characteristics of Claim 1.

[0013] The embodiment of a convertible top according to the invention with a clamping device acting on the flexible roof panel, which is designed with at least one bracket that forces the flexible roof panel in the closed state of the convertible top against an auto-body closure seal, has the advantage that the joining of the flexible roof panel to the auto body can be done well beneath the rearward auto-body opening line and an auto-body closure seal adjacent to it, at least in areas, without adversely influencing the effect in the closed state of the convertible top. Since the convertible top can be stored lower with respect to the vehicle height, the deeper joining of the flexible roof panel to the auto body is accomplished, and it is possible to choose a much deeper joining point, relative to the edge solution, of the flexible roof panel with the auto body

compared to a solution with a joining in the area of the edge with a corresponding material length between the rear-window, preferably attached to the flexible roof panel, and the auto-body connection relative to the edge solution can be achieved.

[0014] Because the at least one clip according to the invention can be pivoted on the rear side of the vehicle around an articulation attached to the auto body, the clip can force the flexible roof panel against the auto-body closure seal with a simply designed articulation mechanism during transfer of the convertible top from such a low storage position into a closure position.

[0015] The auto-body closure seal, according to the present invention, is to be understood in its broadest sense and can represent any type of seal that is supposed to prevent entry of water into a body shaft. The auto-body closure seal is advantageously arranged adjacent to the body-opening line.

[0016] The clamping device can be designed both with a single bracket that essentially spans the vehicle width and with several, preferably two, symmetrically arranged brackets, which, in terms of its operation, represent both separately driven units and units that can be moved with the convertible-top rods in connection with the convertible top motion.

[0017] Additional advantages and advantageous embodiments of the object according to the invention can be found in the description, the drawing, and the claims.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0018] In the drawings:

[0019] Fig. 1 shows a perspective partial view of a rear area of a convertible vehicle with a convertible top in the closed state;

[0020] Fig. 2 shows a schematic, simplified cross-section through a clamping device of a convertible top according to the invention of Fig. 1, along line II–II in Fig. 1;

[0021] Fig. 3 shows a schematic, simplified cross-section through the convertible top of Fig. 1 and its clamping device along a line III–III in Fig. 1;

[0022] Fig. 4 shows a schematic cross-section corresponding to Fig. 2 through the clamping device according to the invention in the stored state of the convertible top;

[0023] Fig. 5 shows a simplified perspective view of the clamping device according to the invention in the closed state of the convertible top according to Figs. 1 through 3.

[0024] Fig. 6 shows a view of the clamping device according to Fig. 5 in a partially opened state of the convertible top;

[0025] Fig. 7 shows a perspective view of the clamping device corresponding to Fig. 5 and Fig. 6 in the stored state of the convertible top; and

[0026] Fig. 8 shows a partial perspective view of the top of the convertible vehicle of Fig. 1 with an alternative embodiment of the clamping device.

#### DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0027] A rear area of a convertible vehicle 1 is shown in Fig. 1, in which a convertible top 2 can be moved between a closed position lying against a roof peak of vehicle 1 and a stored position in a storage space 3 in the rear.

[0028] The convertible top 2 is designed as a so-called soft top or fabric convertible top with a flexible roof panel 4, which is attached to an arrangement of convertible-top rods 5 supporting it and causing movement of the convertible top 2, and connected with its edge region to the vehicle body 7 beneath a rear window 6.

[0029] For this purpose, the vehicle body 7 has an attachment device 9 beneath a body opening line with an auto-body closure seal 8, further shown in Fig 2 through Fig. 4. The attachment device 9 is designed in the depicted variant with a clamping strip 10 that holds the

flexible roof panel 4, and connection contours 11 for joining to a clip 22 or to other body elements in the region of a body shaft 12, for example, a water-channel profile or a convertible top sheet.

[0030] For tightening of the flexible roof panel 4 in the closed state of convertible top 2, a clamping device 13 is provided, which, in the variant according to Fig. 1 through Fig. 7, is designed with two brackets 14, 15 assigned to each side of the vehicle.

[0031] The side brackets 14, 15 can be moved between a first position, shown schematically in Fig. 4 through Fig. 7 with the convertible top 2 stored, and a position shown in Figs. 1, 2, 3, and 5 in the closed state of the convertible top 2, whereby the brackets 14, 15 in the closed state of convertible top 2 force the roof panel 4 against the auto-body closure seal 8 arranged in the region of the body-opening line.

[0032] The body-opening line in the variant shown is formed by an upper edge of the side outer surface 16 of the auto-body, above a wheel opening 17 and by an upper edge of a rear cover 18, but in a departure from this, it can also be provided that, for example, instead of the rear cover 18, a rear body element designed in several parts also forms the body-opening line.

[0033] As can also be seen from the theoretical clamping direction 19 of the flexible roof panel 4 drawn in Fig. 2 and Fig. 3, the clamping direction of the flexible roof panel 4 is changed by the clamping device 13, so that in the closed state of the convertible top 2, it lies sealed against the body closure seal 8.

[0034] In the advantageous embodiment shown according to Fig. 1 through Fig. 7, the side brackets 14, 15 can be pivoted on their rear ends about a pivot point 20 and 21, which is attached to the body and is arranged, in this case, on the attachment device 9 of the vehicle body 7 for the flexible roof panel 4.

[0035] The attachment device 9 in the depicted variants consists essentially of an at least roughly U-shaped clip 22 extending over the vehicle width, on which the clamping profile or strip 10 is mounted, at least in areas, to hold the flexible roof panel 4.

[0036] Depending on the application, an expert in the art will also be able to select an attachment of the flexible roof panel to clip 22 with a clamping profile deviating from the variant shown or another element attached to the auto body by means of screwing, riveting, etc., if this is more appropriate for the specific application.

[0037] In the variants shown, the clip 22 of the attachment device 9 is joined with its corresponding ends to a convertible-top main support 23 arranged in the side area of the vehicle, on which a drive device (not further shown) engages and drives the convertible-top rod 5. With respect to its dimensioning, the clip 22, in the present case, is larger than brackets 14, 15 which are arranged more inside of the vehicle than the clip 22.

[0038] The side brackets 14, 15 are articulated at their ends on the vehicle front by means of a toggle lever 24 and the convertible-top rod 5 to the main convertible-top support 23, in which the articulation is arranged at a higher point, with respect to the vehicle height, than the articulation of clip 22 of the attachment device 9.

[0039] The clamping device 13 connected to the convertible-top rod 5 and thereby to the main convertible-top support 23, in the variant according to Fig. 1 through Fig. 7, is movable by means of the drive device (not further shown) that drives the convertible-top rods 5, which, for example, a hydraulic cylinder, and can therefore be moved with the motion of the convertible-top rods 5.

[0040] An alternative variant of a clamping device 13' for the flexible roof panel 4 of the convertible top 2, corresponding in design to the depiction of Fig. 1 to Fig. 7, is shown in Fig. 8.

[0041] In contrast to the variant according to Fig. 1 through Fig. 7, with two side brackets 14, 15, the clamping device 13' depicted in Fig. 8 is designed with a single bracket 25, which is

designed essentially U-shaped, like the clip 22 of the attachment device 9, and is joined with its ends to the corresponding side main convertible-top support 23. In its rear area, in the region of the transition between the side arms to the cross-arm of the U-shaped bracket 25, this bracket is connected on both sides by means of a toggle lever 26 and 27 to the clip 22 of the attachment device 9 and is thereby attached to the body.

**[0042]** Bracket 25, similar to the side brackets 14, 15 provided in the variant according to Fig. 1 through Fig. 7, can be moved from a position with the stored convertible top 2, in which bracket 25 is essentially situated at the vehicle height of clip 22 of the attachment device 9, into a position that forces the flexible roof panel 4 against the auto-body closure seal 8. In contrast to the variant according to Fig. 1 through Fig. 7, a separate drive for bracket 25 is provided here, which can be controlled as a function of the motion of the convertible-top rod 5.

**[0043]** In other variants, it can naturally be provided that a clamping device that corresponds essentially to the clamping device 13 depicted in Fig. 1 through Fig. 7, is equipped with a separate drive, or that a single clip be connected as in Fig. 8 to the convertible-top rod 5 without its own drive.



## LIST OF REFERENCE NUMBERS

- 1 Convertible vehicle
- 2 Convertible top
- 3 Storage space
- 4 Flexible roof panel
- 5 Convertible-top rod
- 6 Rear window
- 7 Vehicle body
- 8 Auto-body closure seal
- 9 Attachment device
- 10 Clamping profile
- 11 Connection contours
- 12 Body shaft
- 13 Clamping device
- 13' Clamping device
- 14 Side bracket
- 15 Side bracket
- 16 Outer surface
- 17 Wheel opening
- 18 Rear cover
- 19 Theoretical clamping direction
- 20 Pivot point
- 21 Pivot point
- 22 Clip of the attachment device
- 23 Main convertible-top support
- 24 Toggle lever
- 25 Bracket
- 26 Toggle lever
- 27 Toggle lever